



EXISTING CONDITIONS MEMORANDUM

TO: Cliff Sinnott, Executive Director, Rockingham Planning Commission

FROM: Gene McCarthy, P.E., Project Manager, McFarland Johnson, Inc.

DATE: April 21, 2010

PROJECT: Windham NH Route 111 Corridor and Wall Street Extension Study

McFarland Johnson (MJ) has conducted an existing roadway conditions evaluation as part of the NH Route 111 Corridor and Wall Street Extension Study. The study limits are NH Route 111 from west of South Lowell Road to Interstate 93 at Exit 3 and includes Wall Street and North Lowell Road in Windham NH. Figure A-1 in Appendix A depicts the study area. The following sections outline the existing conditions of the various roadways and intersections within the project limits. An analysis of crash history is also included.

NH Route 111

The existing NH Route 111 (NH 111) corridor within the study limits is a two-lane Urban Principal Arterial that conveys approximately 21,000 vehicles per day (2007). It is the most southerly east-west highway in New Hampshire and therefore serves as a major corridor for regional traffic. Peak flows travel eastbound towards Interstate 93 (I-93) in the morning and westbound from I-93 in the afternoon. The speed limit is posted as 40 mph but with shoulders and minimal roadside features, the roadway has the feeling of a highway causing vehicles to travel at higher speeds. The corridor has one lane in each direction with a center turn lane in several locations and right turn lanes at several intersections and entrances. Within the study limits there are a limited number of driveways, which reduces conflicts for NH 111 traffic. There are no sidewalks or bike paths along the roadway, but crosswalks and concrete sidewalk ramps are present at the signalized intersections.



NH Route 111 Looking West from No. Lowell Road



NH Route 111 Looking East from Church Street

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The existing pavement conditions vary as it appears recent road re-surfacing has taken place. The intersection of North Lowell Road and NH 111 has been recently paved and is therefore in good condition. The same is true of the intersection of NH 111 and Church Street and the pavement east towards the shopping plazas. A section of pavement exists between the intersection of Church Street and the intersection of North Lowell Road where the pavement has not been rehabilitated and large cracks have appeared along the shoulders with smaller cracks appearing within the travel way. The pavement along NH 111 west of the North Lowell Road intersection and east of the Hardwood Road intersection appears to be in good condition. Photos of the NH 111 pavement can be seen below. The pavement markings appear to be in good condition along both the new and old sections of pavement. The site distances throughout the corridor are all satisfactory as the roadway is wide.



Section of "Old" Pavement on NH Route 111



Cracks in Pavement on NH Route 111



Intersection of NH Route 111 and North Lowell Road



Intersection of NH Route 111 and Hardwood Avenue

The commercial properties along NH 111 all have their own individual driveways. If a customer wishes to patronize two businesses in adjoining shopping malls, they must drive on NH 111 to access the two parking lots. These trips reduce capacity and increase vehicle conflicts for those traveling on NH 111. The lack of sidewalks and interconnection between businesses also means that those willing to walk between two shopping centers cannot do so without walking on the shoulders of NH 111. If access between adjoining commercial properties could be managed effectively, trips on NH 111 could be reduced.

North Lowell Road

North Lowell Road north of NH Route 111 is an Urban Collector Road that conveys approximately 5,100 vehicles per day (2009). It provides access to I-93 via NH Route 111 for the residential areas in northern Windham, southern Derry, and southern Londonderry. Peak flows travel southbound in the morning and northbound in the afternoon, coinciding with the peak flows directed to I-93. The alternate route for these commuters is to use Exit 4 on I-93, which is 6 miles further north. The posted speed limit is 35 mph with one lane in each direction and shoulders 1 to 2-feet in width. There are no sidewalks or bike paths along the roadway and the narrow shoulders make pedestrian and bicycle use difficult.

The horizontal and vertical grades are adequate except near the intersection with NH 111. North Lowell Road has an immediate sharp curve and a moderately steep grade north of the intersection with NH 111. Site distances along the southern 600-700 feet, near the town offices, are poor due to the combination of horizontal and vertical curvature. The pavement has significant cracking along the edges and within the travel ways in this area as well.



Limited Sight Distance Exiting Town Offices



Paved Drainage Ditch, North Lowell Road



Cracks in Pavement along North Lowell Road



North Lowell Road, Looking North

Church Street

Church Street is a local road that connects NH 111 to North Lowell Road and allows vehicles traveling west on NH 111 to bypass the signalized intersection at NH 111 and North Lowell Road. Approximately half way down Church Street there is a driveway that leads north to the *Windham Terrace* Assisted Living facility. From this driveway to the east, Church Street is one-way. Vehicles can enter Church Street from NH 111 but cannot exit. West of the driveway Church Street permits traffic in both directions for access to *Windham Terrace*.

The pavement is in poor condition with significant cracking and frost heaves. There is a new section of pavement where Church Street crosses over Golden Brook. It appears the culvert has been recently improved including new guardrail. Church Street once was a two-way street with traffic permitted to exit on to NH 111, as double yellow pavement markings are still evident down the centerline. There are no sight distance issues created by the geometry of the roadway but it may be difficult to see oncoming traffic heading north on North Lowell Road when attempting to exit Church Street. No sidewalks or bike paths exist along the roadway. There is no posted speed limit along the roadway but it is estimated to be 35 mph.



Looking West Down Church Street



Intersection with North Lowell Road, Looking South

Wall Street

Wall Street is a dead-end local road that provides access to commercial properties. It is connected to NH 111 via a signalized intersection. Wall Street provides access to a shopping mall that includes a Shaw's supermarket, a state park and ride lot, a bank, an office building, and an industrial business via International Road. There is direct egress to the shopping mall from NH 111, however, only for westbound traffic. All eastbound traffic heading to the shopping mall must use Wall Street. There is no posted speed limit along the roadway and there are no sidewalks or bike paths. The pavement is in good condition.



Looking at Wall Street from NH Route 111



Wall Street, Looking North

NH Route 111 / South Lowell Road / Hardwood Avenue Intersection

The NH 111/South Lowell Road/Hardwood Avenue Intersection is a 4-way signalized intersection at the western edge of the Windham Village Center. South Lowell Road is a local road that provides a connection to NH Route 111A south of this intersection. Hardwood Avenue is a local road that connects to residential neighborhoods in Windham.

Traffic counts were collected at this intersection in December 2009 for both the morning and afternoon peak periods. Figure B-1 in Appendix B shows the peak hour volumes in the morning and afternoon. The traffic analysis for the intersection indicates that it operates at Level of Service (LOS) C for both the morning and afternoon peak hour. See Appendix C for a description of Level of Service (LOS). The relatively good level of service is a result of the low turning volumes at this intersection. However, the eastbound queue on NH 111 in the morning can reach up to 30 vehicles and 800 feet. The high volume of traffic on NH 111 causes long queues even with a short delay.

NH 111 is on a horizontal curve as it passes through the intersection, which creates some sight distance issues. Vehicles traveling on NH 111 have an adequate view of the signalized intersection, but not of the roadway beyond. The left turning vehicles are controlled by the signal and therefore do not pose any safety concerns. Vehicles turning right onto NH 11 from South Lowell Road have sufficient views of the highway because the corridor is wide in this area. However, vehicles turning right onto NH 111 from Hardwood Avenue have insufficient sight distance. As a result, no right turns on red are allowed from Hardwood Avenue.



*NH Route 111, Looking East at South Lowell Road and
Hardwood Avenue Limited Sight Distance turning from Hardwood Avenue*

NH Route 111 / North Lowell Road / Fellows Road Intersection

The NH 111/North Lowell Road/Fellows Road Intersection is a 4-way signalized intersection at the Village Center in Windham. Fellows Road is a dead-end local road that provides access to the Windham Police Station, Windham Fire Station, and the Nesmith Library. As the junction between the two commuter routes, NH 111 and North Lowell Road, the intersection experiences significant queuing on North Lowell Road and NH 111. The queue for vehicles making a left turn from North Lowell Road backs up past the right turn lane, prohibiting these vehicles from entering the right turn lane queue.

Traffic counts were collected at the intersection in December 2009 for both the morning and afternoon peak periods. Figure B-2 in Appendix B shows the morning and afternoon peak hour volumes. The traffic analysis for the intersection indicates that it operates at LOS D during the morning peak hour and LOS C during the afternoon peak hour. The lower LOS in the morning is due to the heavy movement from southbound North Lowell Road to eastbound NH 111 since this movement must wait for a green left arrow. The queue on North Lowell Road can reach 25 vehicles and 500 feet in length. The return movement for this traffic in the afternoon uses Church Street to bypass the signal. The queues on NH 111 can reach 40 vehicles and 900 feet in the morning for eastbound traffic and in the afternoon for westbound traffic.

Residents have reported that the detectors in the pavement for the North Lowell Road approach to the intersection are not working properly, causing improper traffic phasing that decreases the level of service of the intersection.

NH 111 is on a horizontal curve as it passes North Lowell Road and Fellows Road, which creates some sight distance issues. Vehicles traveling on NH 111 have an adequate view of the signalized intersection, but not of the roadway beyond. However, vehicles turning on to NH 111 from North Lowell Road and Fellows Road have restricted views of the highway. The left turning vehicles are controlled by the signal and therefore do not pose any safety concerns. Vehicles turning right from Fellows Road have restricted views of NH 111 due to the roadway curvature, roadside signs, and roadside vegetation. This restricted sight distance poses safety concerns for turns made on a red light. Right turning vehicles from North Lowell Road have sufficient sight distance on NH 111.



*Queuing on North Lowell Road near
NH Route 111*



*NH Route 111, Looking West at North Lowell Road and
Fellows Road*



Limited Sight Distance turning from Fellows Road



Looking at Fellows Road from NH Route 111

NH Route 111 / Windham Village Green / US Post Office Intersection

The NH 111 / Windham Village Green / US Post Office Intersection is a 4-way signalized intersection that provides access to two retail destinations. The Windham Village Green shopping plaza and the Windham Post Office legs of the intersection are more driveways than roadways as both are dead ends.

The traffic generation for both the Windham Village Green shopping plaza and the Windham Post Office were calculated using Institute of Transportation Engineers (ITE) Trip Generation curves. These values were confirmed by traffic counts conducted at the intersection in March 2010. The NH 111 counts were collected in December 2009. Figure B-3 in Appendix B shows morning and afternoon peak hour volumes. The traffic analysis for the intersection indicates that it operates at LOS A during the morning peak hour and LOS A during the afternoon peak hour. The good level of service is a result of the low turning volumes at this intersection.

NH 111 through this intersection is a straight roadway with wide lanes and shoulders. However, there is a vertical crest curve east of the intersection that has a high point approximately 400 feet from the intersection. Vehicles traveling westbound on NH 111 have an adequate view of the signal, but not necessarily of the queue of vehicles waiting at the intersection. Vehicles turning right onto NH 111 from the Post Office have sufficient views of the highway. However, vehicles turning right onto NH 111 from the Windham Village Green shopping have restricted views. The sight distance is adequate for the posted speed, however, vehicles often travel above the speed limit and this does pose a potential safety issue.



NH Route 111, Looking West at Windham Village Green and Windham Post Office



Looking at Windham Village Green Plaza from NH Route 111



Limited Sight Distance turning from Windham Village Green Plaza

NH Route 111 / Wall Street Intersection

The NH 111/Wall Street Intersection is a 3-way signalized intersection that provides access to Wall Street. As mentioned above, Wall Street is a dead-end local street that provides access to several commercial properties.

Traffic counts were collected in December 2009 at the intersection for both the morning and afternoon peak periods. Figure B-4 in Appendix B shows the morning and afternoon peak hour volumes. The traffic analysis indicates that this intersection operates at LOS A during the morning peak hour and LOS B during the afternoon peak hour. The good level of service is a result of the low turning volumes at this intersection. However, the queue on NH 111 in the afternoon for westbound travel can reach 30 vehicles and 750 feet. The high volume of traffic on NH 111 backs up quickly even with a short delay.

Through this intersection NH 111 is a straight roadway with wide lanes and shoulders. However, there is a vertical crest curve east of the intersection that has a high point approximately 450 feet from the intersection. Vehicles turning right onto NH 111 from Wall Street have restricted views. The sight distance is adequate for the posted speed, however, vehicles often travel above the speed limit and this does pose a potential safety issue.

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Looking at NH Route 111 from Wall Street



NH Route 111, Looking West at Wall Street



Limited Sight Distance turning from Wall Street

Safety Issues/Crash History

The majority of crashes along NH 111 were attributed to driver inattention, distraction, or error. A high percentage of these crashes were rear end collisions. Typically, these types of crashes indicate congestion in the area. A majority of the crashes along the corridor occurred at intersections or at the Interstate ramps.

The data analyzed in this study dates from January 2004 to December 2008, but excludes 2005. The data was collected along NH 111 from Ledge/Lexington Road to the I-93 Northbound ramps at Exit 3. A total of 81 crashes were reported during that timeframe. Twenty-four of these crashes resulted in a total of 31 injuries. Most crashes have been categorized as property damage only. None of the crashes reported in this area resulted in fatalities. See the attached Crash Summary Plan in Appendix A.

The NH 111/South Lowell Road Intersection reported five crashes, with one crash resulting in an injury. All of these crashes were rear end collisions and involved vehicles approaching the signal from the east. The restricted sight distance due to the horizontal curve at the intersection may conceal those vehicles in the left turn lane queue. The congestion during peak periods may contribute to the number of rear end collisions.

The NH 111/North Lowell Road Intersection reported 19 crashes, with six crashes resulting in seven injuries. Most of the crashes were rear end collisions caused by inattentive drivers. The low percentage of injury related crashes and the high percentage of rear end collisions are most likely the result of congestion. Congestion related crashes do not usually result in injury due to the low speeds of the vehicles involved. There was an even distribution of crashes to traffic approaching from the east and approaching from the west, indicating congestion in both directions.

The NH 111/Wall Street Intersection reported 13 crashes, with four of the crashes resulting in four injuries. A large number of the crashes were rear end collisions which indicate congestion in the area. There were also crashes that occurred while making turning movements and merging with other vehicles. These crashes can sometimes be attributed to improper sight distance or poor intersection design. Specifically, when traffic is exiting Wall Street and looking towards the east there is a crest vertical curve that may hinder the ability to see approaching traffic. Combining this poor sight distance with the high rate of speed in this area creates an unsafe right hand turn for vehicles stopped at the red light exiting Wall Street. Prohibiting the right turn on red movement when exiting Wall Street may reduce the crash rate at this intersection.

Where the I-93 northbound and southbound ramps intersect with NH 111 there were 13 crashes reported with two of those crashes resulting in two injuries. Three of the crashes occurred at the I-93 southbound access point while eight occurred at the northbound access point. Five of these crashes, including the one resulting in injury, were rear end crashes. It should be noted that heavy construction has been taking place in this area, which affects the normal roadway condition and geometry. At the intersection of NH 111 and the I-93 southbound ramps there are no traffic signals, while traffic signals do exist at the intersection of NH 111 and the I-93 northbound ramps. There were two sideswipe collisions that occurred when vehicles were attempting to make a left hand turn onto NH 111 from the I-93 southbound off ramp. The widening of I-93 currently under construction will change the configuration of Exit 3. The new NH 111 intersections with the I-93 ramps will both be signalized.

There were 33 crashes reported along NH 111 where no major intersections were located. Thirteen of these crashes resulted in 18 injuries. The higher percentage of crashes resulting in injury is directly related to the higher speeds the vehicles are traveling in these areas. Thirteen of these crashes were reported near the intersection of NH 111/Church Road and in front of the adjacent shopping plaza with two resulting in injury. These crashes may be indicative of the difficulty in entering and exiting the shopping plaza due to the high speeds and congestion along NH 111. There was also a cluster of

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reported crashes near the NH 111/Bell Road intersection. Seven crashes were reported at this location with three of them resulting in injury. There are three residential roads along the south side of NH 111 in this area opposite three driveways on the north side of NH 111. These small residential roads have overgrown vegetation and they can be difficult to see when traveling along NH 111. Entering NH 111 from one of these residential roads is difficult with the high volume of traffic along the roadway and the high speeds of the vehicles. The remaining crashes along NH 111 had no apparent pattern and were caused by driver error or weather conditions. The table below summarizes the crash history for the various road segments.

Crash Summary

Segment	Number of Crashes	Injury Crashes	Number of Rear End Collisions (Percentage of Total)
NH 111/Hardwood Intersection	5	1	5 (100%)
NH 111/North Lowell Road Intersection	19	6	14 (74%)
NH 111/Wall Street Intersection	13	4	8 (62%)
NH 111/Church Street-Shopping Plaza Area	13	2	10 (77%)
NH 111/Bell Road Intersection Area	7	3	2 (29%)
NH 111/I-93 SB Ramps Intersection	4	1	2 (50%)
NH 111/I-93 NB Ramps Intersection	9	1	4 (44%)
NH 111 Remaining Roadway (No Patterns)	11	6	4 (36%)

Circulation and Operational Issues

As mentioned in the sections above, there are several important roadway corridors in the study area. I-93 is the primary north to south corridor in the State of New Hampshire. NH 111 is the most southern, and one of the few, east to west corridors in the state. These two corridors meet at Exit 3 in Windham. As a result, significant volumes of commuter traffic utilize NH 111 to access I-93.

North Lowell Street is the first collector road that crosses NH 111 on the west side of I-93, and this is why there is significant commuter traffic on North Lowell Street. A new connection to NH 111 would help to alleviate the congestion on North Lowell Street through the Windham Village Center. An extension of Wall Street has been identified as a possible solution since a portion of the road exists and a signalized intersection connects it to NH 111. The Wall Street extension could attract much of this commute traffic and keep it away from the Village Center.

APPENDICES

Appendix A - Figures

Appendix B – Peak Hour Traffic Volumes 2009

Appendix C – Signalized Intersection Level of Service (LOS)